

## Delineation of Teesta river basin from remotely sensed digital elevation data

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### ABSTRACT

Identification, classification, and monitoring of the earth resources along with detailed topographic information for use in hydrological analysis and modelling can be easily done by using remote sensing. Present study was conducted for selection of watershed outlet, developing the watershed boundary, clipping the watershed from the entire basin and the streamline generation for Teesta river watersheds from SRTM data. Using the ERDAS IMAGINE 8.6 and ArcGIS 9.2 software the delineation was done. A total number of 163959 sinks were found to be present in the DEM data, after sink filling the numbers of sinks were reduced to 6225 that gave continuous stream network. The Teesta river watersheds boundaries were generated from the filled DEM data. Watershed catchment was delineated by superimposing this clipped stream network over watershed boundary image. Satellite imageries, soil data, land use, land cover map etc. can be generated to develop a detailed database for quick reference of the hydrologists working in the region.

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**Key words :** SRTM data, ArcGIS 9.2, Watershed delineation

### INTRODUCTION

Remote sensing is the science of obtaining information about an object, area, or phenomenon, through the analysis of data acquired by a sensor that is not in contact with the object. In this regard the significant areas of concern are accurate delineation of watershed and development of a hydrological database with the information like runoff, precipitation, soil, topography, stream network etc. (Gangodagamage, 2001). In remote areas collection of spatial topographic data by ground surveying can be a cumbersome process. Even with the use of very accurate modern surveying techniques like total station, it remains a challenging task to capture and create database for a large river basin. The commonly used topographic data is known as digital elevation model (DEM) where the elevations are recorded in digital format. Salient advantages of such DEM data are easy data acquisition over inaccessible area, data acquisition at different scales and resolutions, and analysis of the data in laboratory to reduce extensive field work.

A major portion of the floodplains of North Bengal is frequently affected by floods. Therefore, the area has a vast scope for the researchers to conduct hydrological studies. But the non-availability of relevant hydrological data for the area is a major constraint for conducting such investigations. There is an urgent need to develop a hydrologic database for the major river basins of the area

as till now no such database is available with the hydrologist working in North Bengal. Keeping this in view, the present project work was undertaken to carry out raster based analysis for delineating watershed areas of Teesta river basins using ArcGIS software and generate stream network and extract DEM data for Teesta river basins of North Bengal.

### MATERIALS AND METHODS

The Teesta River is a 'trans-Himalayan' river flowing through the entire state of Sikkim. This river forms the boundary between Sikkim and West Bengal before merging with the Brahmaputra in Bangladesh as a tributary. The river originates from the Cho Lhamu Lake at an average height of 5,330 metres (17,500 feet) above mean sea level in the majestic Himalayas. The total length of the river is about 315 km.

#### Remotely sensed elevation data :

Geographical information system (GIS) has emerged as a significant support tool for managing and analyzing land and water resource from digital elevation model (DEM) of land terrain. Remotely sensed digital elevation data have been used for the area for developing a database for the watershed. Since the Earth is three-dimensional, it would seem that all GIS application include some element of three-dimensional analysis. To, meet this

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